

Appendix H:

Common Elements -- Work Breakdown Structure and Definitions

H.1 -- Scope

This appendix provides the WBS elements common to all types of systems. Applicable government and non-government documents are listed. Definitions for the common WBS elements are provided in this appendix.

H.2 -- Applicable Documents

The following standards form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the issue of the Department of Defense Index of Specifications (DODISS) and supplement thereto, cited in the solicitation.

Standards

ML-STD-1464, *Army Nomenclature System*

MIL-STD-1661, *Mark and Mod Nomenclature System*

MIL-STD-1812, *Type Designation, Assignment and Method for Obtaining*

Other Government Documents

The following other government documents, drawings, and publications form a part of this document to the extent specified herein. Unless otherwise specified, the issues are those cited in the solicitation.

DOD 5010.12-L, *Acquisition Management Systems and Data Requirements Control List (AMSDL)*

Unless otherwise indicated, copies of federal and military specifications, standards, and handbooks are available from the:

Standardization Documents Order Desk
700 Robbins Avenue
Building #4, Section D
Philadelphia, PA 19111-5094

H.3 -- Definitions

H.3.1 -- Integration, Assembly, Test, and Checkout

In those instances in which an integration, assembly, test, and checkout element is used (Appendices A through G), this element includes all effort of technical and functional activities associated with the design, development, and production of mating surfaces, structures,

equipment, parts, materials, and software required to assemble the level 3 equipment (hardware/software) elements into a level 2 mission equipment (hardware/software) as a whole and not directly part of any other individual level 3 element.

Includes:

- the development of engineering layouts, determination of overall design characteristics, and determination of requirements of design review
- the set up, conduct, and review of testing assembled components or subsystems prior to installation
- the detailed production design, producibility engineering planning (PEP), and manufacturing process capability, including the process design development and demonstration effort to achieve compatibility with engineering requirements and the ability to produce economically and consistent quality
- inspection activities related to receiving, factory and vendor liaison
- design maintenance effort
- quality planning and control
- tooling (initial production facilities, factory support equipment) including planning, design, and fabrication
- administrative engineering
- the joining or mating and final assembly of level 3 equipment elements to form a complete prime mission equipment when the effort is performed at the manufacturing facility
- integration of software (including loading and verification of firmware)
- conduct of production acceptance testing

Excludes:

- all systems engineering/program management and system test and evaluation which are associated with the overall system

Note: ***When an integration, assembly, test, and checkout element is utilized at lower levels of the contract work breakdown structure, it will be summarized into the next higher level equipment (hardware/software) work breakdown structure element and should never be summarized directly into a level 3 integration, assembly, test, and checkout element.***

H.3.2 -- Systems Engineering/Program Management

The systems engineering and technical control as well as the business management of particular systems and programs. Systems engineering/program management elements to be reported and their levels will be specified by the requiring activity.

Includes:

- the overall planning, directing, and controlling of the definition, development, and production of a system or program including supportability and acquisition logistics, e.g., maintenance support, facilities, personnel, training, testing, and activation of a system

Excludes:

- systems engineering/program management effort that can be associated specifically with the equipment (hardware/software) element

Systems Engineering

The technical and management efforts of directing and controlling a totally integrated engineering effort of a system or program.

Includes but not limited to:

- effort to define the system and the integrated planning and control of the technical program efforts of design engineering, specialty engineering, production engineering, and integrated test planning
- effort to transform an operational need or statement of deficiency into a description of system requirements and a preferred system configuration
- technical planning and control effort for planning, monitoring, measuring, evaluating, directing, and replanning the management of the technical program
- (all programs, where applicable) value engineering, configuration management, human factors, maintainability, reliability, survivability/vulnerability, system safety, environmental protection, standardization, system analysis, logistic support analysis, etc.
- (for ships) the extended Ship Work Breakdown Structure (ESWBS), Configuration Management (811), Human Factors (892), Standardization (893), Value Engineering (894), and Reliability and Maintainability (895) elements

Excludes:

- actual design engineering and the production engineering directly related to the WBS element with which it is associated

Examples of systems engineering efforts are:

- 1) System definition, overall system design, design integrity analysis, system optimization, system/cost effectiveness analysis, and intra-system and inter-system compatibility assurance, etc.; the integration and balancing of reliability, maintainability, producibility, safety, human health, environmental protection, and survivability; security requirements, configuration management and configuration control; quality assurance program, value engineering, preparation of equipment and component performance specifications, design of test and demonstration plans; determination of software development or software test facility/environment requirements.
- 2) Preparation of the Systems Engineering Management Plan (SEMP), specification tree, program risk analysis, system planning, decision control process, technical performance measurement, technical reviews, subcontractor and vendor reviews, work authorization, and technical documentation control.
- 3) Reliability engineering -- the engineering process and series of tasks required to examine the probability of a device or system performing its mission adequately for the period of time intended under the operating conditions expected to be encountered.
- 4) Maintainability engineering -- the engineering process and series of tasks required to measure the ability of an item or system to be retained in or restored to a specified condition of readiness, skill levels, etc., using prescribed procedures and resources at specific levels of maintenance and repair.
- 5) Human factors engineering -- the engineering process and the series of tasks required to define, as a comprehensive technical and engineering effort, the integration of doctrine, manpower, and personnel integration, materiel development, operational effectiveness, human characteristics, skill capabilities, training, manning implication, and other related elements into a comprehensive effort.
- 6) Supportability analyses -- an integral part of the systems engineering process beginning at program initiation and continuing throughout program development. Supportability analyses form the basis for related design requirements included in the system specification and for subsequent decisions concerning how to most cost effectively support the system over its entire life cycle. Programs allow contractors the maximum flexibility in proposing the most appropriate supportability analyses.

Program Management

The business and administrative planning, organizing, directing, coordinating, controlling, and approval actions designated to accomplish overall program objectives which are not associated with specific hardware elements and are not included in systems engineering.

Includes for example:

- cost, schedule, performance measurement management, warranty administration, contract management, data management, vendor liaison, subcontract management, etc.
- support element management, defined as the logistics tasks management effort and technical control, and the business management of the support elements. The logistics management function encompasses the support evaluation and supportability assurance required to produce an affordable and supportable defense materiel system
- planning and management of all the functions of logistics. Examples are:
 - maintenance support planning and support facilities planning; other support requirements determination; support equipment; supply support; packaging, handling, storage, and transportation; provisioning requirements determination and planning; training system requirements determination; computer resource determination; organizational, intermediate, and depot maintenance determination management; and data management
- (for ships) the Extended Ship Work Breakdown Structure (ESWBS), Project Management (897); Data Management (896); and Supply Support (853) elements.

H.3.3 -- System Test and Evaluation

The use of prototype, production, or specifically fabricated hardware/software to obtain or validate engineering data on the performance of the system during the development phase (normally funded from RDT&E) of the program.

Includes:

- detailed planning, conduct, support, data reduction and reports (excluding the Contract Data Requirements List data) from such testing, and all hardware/software items which are consumed or planned to be consumed in the conduct of such testing
- all effort associated with the design and production of models, specimens, fixtures, and instrumentation in support of the system level test program

Note: ***Test articles which are complete units (i.e., functionally configured as required by specifications) are excluded from this work breakdown structure element.***

Excludes:

- all formal and informal testing up through the subsystem level which can be associated with the hardware/software element

- acceptance testing

Note: *These excluded efforts are to be included with the appropriate hardware or software elements.*

H.3.3.1 -- Development Test and Evaluation

This effort is planned, conducted and monitored by the developing agency of the DoD component. It includes test and evaluation conducted to:

- demonstrate that the engineering design and development process is complete.
- demonstrate that the design risks have been minimized.
- demonstrate that the system will meet specifications.
- estimate the system's military utility when introduced.
- determine whether the engineering design is supportable (practical, maintainable, safe, etc.) for operational use.
- provide test data with which to examine and evaluate trade-offs against specification requirements, life cycle cost, and schedule.
- perform the logistics testing efforts to evaluate the achievement of supportability goals, the adequacy of the support package for the system, (e.g., deliverable maintenance tools, test equipment, technical publications, maintenance instructions, and personnel skills and training requirements, etc.).

Includes, for example:

- all contractor in-house effort
- (all programs, where applicable) models, tests and associated simulations such as wind tunnel, static, drop, and fatigue; integration ground tests; test bed aircraft and associated support; qualification test and evaluation, development flight test, test instrumentation, environmental tests, ballistics, radiological, range and accuracy demonstrations, test facility operations, test equipment (including its support equipment), chase and calibrated pacer aircraft and support thereto, and logistics testing
- (for aircraft) avionics integration test composed of the following:
 - test bench/laboratory, including design, acquisition, and installation of basic computers and test equipments which will provide an ability to simulate in the laboratory the operational environment of the avionics system/subsystem
 - air vehicle equipment, consisting of the avionics and/or other air vehicle subsystem modules which are required by the bench/lab or flying test bed in

order to provide a compatible airframe avionics system/subsystem for evaluation purposes

- flying test bed, including requirements analysis, design of modifications, lease or purchase of test bed aircraft, modification of aircraft, installation of avionics equipment and instrumentation, and checkout of an existing aircraft used essentially as a flying avionics laboratory
- avionics test program, consisting of the effort required to develop test plans/procedures, conduct tests, and analyze hardware and software test results to verify the avionics equipments' operational capability and compatibility as an integrated air vehicle subsystem
- software, referring to the effort required to design, code, de-bug, and document software programs necessary to direct the avionics integration test
- (for engines) engine military qualification tests and engine preliminary flight rating tests
- (for ships) model basin, hydrostatic, fatigue, shock, special sea tests and trials, etc., including the Extended Ship Work Breakdown Structure (ESWBS), Trials Agenda Preparation, Data Collection & Analysis (842); Dock and Sea Trials (9823); and Hull Vibration Survey (9825) elements

H.3.3.2 -- Operational Test and Evaluation

The test and evaluation conducted by agencies other than the developing command to assess the prospective system's military utility, operational effectiveness, operational suitability, logistics supportability (including compatibility, inter-operability, reliability, maintainability, logistic requirements, etc.), cost of ownership, and need for any modifications.

Includes, for example:

- Initial operational test and evaluation conducted during the development of a weapon system
- such tests as system demonstration, flight tests, sea trials, mobility demonstrations, on-orbit tests, spin demonstration, stability tests, qualification operational test and evaluation, etc., and support thereto, required to prove the operational capability of the deliverable system
- contractor support (e.g., technical assistance, maintenance, labor, material, etc.) consumed during this phase of testing
- logistics testing efforts to evaluate the achievement of supportability goals and the adequacy of the support for the system (e.g., deliverable maintenance tools, test equipment, technical publications, maintenance instructions, personnel skills and training requirements, and software support facility/environment elements)

H.3.3.3 -- Mock-Ups

The design engineering and production of system or subsystem mock-ups which have special contractual or engineering significance, or which are not required solely for the conduct of one of the above elements of testing.

H.3.3.4 -- Test and Evaluation Support

The support elements necessary to operate and maintain, during test and evaluation, systems and subsystems which are not consumed during the testing phase and are not allocated to a specific phase of testing.

Includes, for example:

- repairable spares, repair of repairable, repair parts, warehousing and distribution of spares and repair parts, test and support equipment, test bed vehicles, drones, surveillance aircraft, tracking vessels, contractor technical support, etc.

Excludes:

- operational and maintenance personnel, consumables, special fixtures, special instrumentation, etc., which are utilized and/or consumed in a single element of testing and which should be included under that element of testing

H.3.3.5 -- Test Facilities

The special test facilities required for performance of the various developmental tests necessary to prove the design and reliability of the system or subsystem.

Includes, for example:

- test tank test fixtures, propulsion test fixtures, white rooms, test chambers, etc.

Excludes:

- brick and mortar-type facilities identified as industrial facilities

H.3.4 -- Training

Deliverable training services, devices, accessories, aids, equipment, and parts used to facilitate instruction through which personnel will learn to operate and maintain the system with maximum efficiency.

Includes:

- all effort associated with the design, development, and production of deliverable training equipment as well as the execution of training services

Excludes:

- overall planning, management, and task analysis function inherent in the WBS element Systems Engineering/Program Management

H.3.4.1 -- Equipment

Distinctive deliverable end items of training equipment, assigned by either a contractor or military service, required to meet specific training objectives.

Includes, for example:

- operational trainers, maintenance trainers, and other items such as cutaways, mock-ups, and models

H.3.4.2 -- Services

Deliverable services, accessories, and aids necessary to accomplish the objectives of training.

Includes:

- training course materials; contractor-conducted training (in-plant and service training); and the materials and curriculum required to design, execute, and produce a contractor developed training program
- materiel, courses, and associated documentation (primarily the computer software, courses and training aids)

Excludes:

- deliverable training data associated with the WBS element Support Data

H.3.4.3 -- Facilities

The special construction necessary to accomplish training objectives.

Includes, for example:

- modification or rehabilitation of existing facilities used to accomplish training objectives

Excludes:

- installed equipment used to acquaint the trainee with the system or establish trainee proficiency
- the brick and mortar-type facilities identified as industrial facilities

H.3.5 -- Data

The deliverable data required to be listed on a Contract Data Requirements List, DD Form 1423.

Includes:

- only such effort that can be reduced or avoided if the data item is eliminated
- (government-peculiar data) acquiring, writing, assembling, reproducing, packaging and shipping the data
- transforming into government format, reproducing and shipping data identical to that used by the contractor but in a different format

H.3.5.1 – Technical Publications

Technical data, providing instructions for installation, operation, maintenance, training, and support, formatted into a technical manual. Data may be presented in any form (regardless of the form or method of recording). Technical orders that meet the criteria of this definition may also be classified as technical manuals.

Includes, for example:

- operation and maintenance instructions, parts lists or parts breakdown, and related technical information or procedures exclusive of administrative procedures
- data item descriptions set forth in categories selected from the Acquisition Management Systems and Data Requirements Control List (DoD 5010.12-L)
- (for ships) Extended Ship Work Breakdown Structure (ESWBS), Technical Manuals and Other Data (856) element

H.3.5.2 -- Engineering Data

Recorded scientific or technical information (regardless of the form or method of recording) including computer software documentation. Engineering data defines and documents an engineering design or product configuration (sufficient to allow duplication of the original items) and is used to support production, engineering and logistics activities.

Includes, for example:

- all final plans, procedures, reports, and documentation pertaining to systems, subsystems, computer and computer resource programs, component engineering, operational testing, human factors, reliability, availability, and maintainability, and other engineering analysis, etc.
- Technical data package (reprocurement package) which includes all engineering drawings, associated lists, process descriptions, and other documents defining physical geometry, material composition, and performance procedures

- (for ships) Extended Ship Work Breakdown Structure (ESWBS), Design Support, Ship's Selected Records (8302); Design Support, Services, Reproduction (8303); and Engineering Drawings and Specifications (855) elements

Excludes:

- computer software or financial, administrative, cost or pricing, or management data or other information incidental to contract administration

H.3.5.3 -- Management Data

The data items necessary for configuration management, cost, schedule, contractual data management, program management, etc., required by the government in accordance with functional categories selected from the DODISS and DoD 5010.12-L.

Includes, for example:

- contractor cost reports, cost performance reports, contract funds status reports, schedules, milestones, networks, integrated support plans, etc.
- (for ships) Extended Ship Work Breakdown Structure (ESWBS), Contract Data Requirements (988) element

H.3.5.4 -- Support Data

The data items designed to document support planning in accordance with functional categories selected from DoD 5010.12-L.

Includes, for example:

- supply; general maintenance plans and reports; training data; transportation, handling, storage, and packaging information; facilities data; data to support the provisioning process and all other support data; and software supportability planning and software support transition planning documents.

H.3.5.5 -- Data Depository

The facility designated to act as custodian to maintain a master engineering specification and establish a drawing depository service for government approved documents that are the property of the U.S. Government. As custodian for the government, the depository, authorized by approved change orders, maintains these master documents at the latest approved revision level. This facility is a distinct entity.

Includes, for example:

- all drafting and clerical effort necessary to maintain documents

Excludes:

- all similar effort for facility's specification and drawing control system, in support of its engineering and production activities.

Note: *When documentation is called for on a given item of data retained in the depository, the charges (if charged as direct) will be to the appropriate data element.*

H.3.6 -- Peculiar Support Equipment

The design, development, and production of those deliverable items and associated software required to support and maintain the system or portions of the system while the system is not directly engaged in the performance of its mission, and which are not common support equipment (See H.3.7 below).

Includes:

- vehicles, equipment, tools, etc., used to fuel, service, transport, hoist, repair, overhaul, assemble, disassemble, test, inspect, or otherwise maintain mission equipment
- any production of duplicate or modified factory test or tooling equipment delivered to the government for use in maintaining the system. (Factory test and tooling equipment initially used by the contractor in the production process but subsequently delivered to the government will be included as cost of the item produced.)
- any additional equipment or software required to maintain or modify the software portions of the system

Excludes:

- overall planning, management and task analysis functions inherent in the work breakdown structure element, Systems Engineering/Program Management
- common support equipment, presently in the DoD inventory or commercially available, bought by the using command, not by the acquiring command

H.3.6.1 -- Test and Measurement Equipment

The peculiar or unique testing and measurement equipment which allows an operator or maintenance function to evaluate operational conditions of a system or equipment by performing specific diagnostics, screening or quality assurance effort at an organizational, intermediate, or depot level of equipment support.

Includes, for example:

- test measurement and diagnostic equipment, precision measuring equipment, automatic test equipment, manual test equipment, automatic test systems, test program sets, appropriate interconnect devices, automated load modules, taps, and

related software, firmware and support hardware (power supply equipment, etc.)
used at all levels of maintenance

- packages which enable line or shop replaceable units, printed circuit boards, or similar items to be diagnosed using automatic test equipment

H.3.6.2 -- Support and Handling Equipment

The deliverable tools and handling equipment used for support of the mission system.

Includes, for example:

- ground support equipment, vehicular support equipment, powered support equipment, nonpowered support equipment, munitions material handling equipment, materiel handling equipment, and software support equipment (hardware and software)

H.3.7 -- Common Support Equipment

The items required to support and maintain the system or portions of the system while not directly engaged in the performance of its mission, and which are presently in the DoD inventory for support of other systems.

Includes:

- acquisition of additional quantities of this equipment needed to support the item
- all efforts required to assure the availability of this equipment to support the item

H.3.7.1 -- Test and Measurement Equipment

The common testing and measurement equipment which allows an operator or maintenance function to evaluate operational conditions of a system or equipment by performing specific diagnostics, screening or quality assurance effort at an organizational, intermediate, or depot level of equipment support.

Includes, for example:

- test measurement and diagnostic equipment, precision measuring equipment, automatic test equipment, manual test equipment, automatic test systems, test program sets, appropriate interconnect devices, automated load modules, taps, and related software, firmware and support hardware (power supply equipment, etc.) used at all levels of maintenance
- packages which enable line or shop replaceable units, printed circuit boards, or similar items to be diagnosed using automatic test equipment

H.3.7.2 -- Support and Handling Equipment

The deliverable tools and handling equipment used for support of the mission system.

Includes, for example:

- ground support equipment, vehicular support equipment, powered support equipment, nonpowered support equipment, munitions material handling equipment, materiel handling equipment, and software support equipment (hardware/software)

H.3.8 -- Operational/Site Activation

The real estate, construction, conversion, utilities, and equipment to provide all facilities required to house, service, and launch prime mission equipment at the organizational and intermediate level.

Includes:

- conversion of site, ship, or vehicle
- system assembly, checkout, and installation (of mission and support equipment) into site facility or ship to achieve operational status
- contractor support in relation to operational/site activation

H.3.8.1 -- System Assembly, Installation, and Checkout on Site

The materials and services involved in the assembly of mission equipment at the site.

Includes, for example:

- installation of mission and support equipment in the operations or support facilities and complete system checkout or shakedown to ensure operational status. (Where appropriate, specify by site, ship or vehicle.)

H.3.8.2 -- Contractor Technical Support

The materials and services provided by the contractor related to activation.

Includes, for example:

- repair of repairable, standby services, final turnover, etc.

H.3.8.3 -- Site Construction

Real estate, site planning and preparation, construction, and other special-purpose facilities necessary to achieve system operational status.

Includes, for example:

- construction of utilities, roads, and interconnecting cabling

H.3.8.4 -- Site/Ship/Vehicle Conversion

The materials and services required to convert existing sites, ships, or vehicles to accommodate the mission equipment and selected support equipment directly related to the specific system.

Includes, for example:

- operations, support, and other special purpose (e.g., launch) facilities conversion necessary to achieve system operational status. (Where appropriate, specify by site, ship or vehicle.)

H.3.9 -- Industrial Facilities

The construction, conversion, or expansion of industrial facilities for production, inventory, and contractor depot maintenance required when that service is for the specific system.

Includes:

- equipment acquisition or modernization, where applicable
- maintenance of these facilities or equipment
- industrial facilities for hazardous waste management to satisfy environmental standards

H.3.9.1 -- Construction/Conversion/Expansion

The real estate and preparation of system peculiar industrial facilities for production, inventory, depot maintenance, and other related activities.

H.3.9.2 -- Equipment Acquisition or Modernization

The production equipment acquisition, modernization, or transferal of equipment for the particular system. (Pertains to government owned and leased equipment under facilities contract.)

H.3.9.3 -- Maintenance (Industrial Facilities)

The maintenance, preservation, and repair of industrial facilities and equipment.

H.3.10 -- Initial Spares and Repair Parts

The deliverable spare components, assemblies and subassemblies used for initial replacement purposes in the materiel system equipment end item.

Includes:

- repairable spares and repair parts required as initial stockage to support and maintain newly fielded systems or subsystems during the initial phase of service, including pipeline and war reserve quantities, at all levels of maintenance and support

Excludes:

- development test spares and spares provided specifically for use during installation, assembly, and checkout on site. Lower level WBS breakouts should be by subsystem.